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Published in:
Psychology & Health

DOI:
10.1080/08870446.2017.1300259

Publication date:
2017

Psychology & Health

ISSN: 0887-0446 (Print) 1476-8321 (Online) Journal homepage: http://www.tandfonline.com/loi/gpsh20

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To cite this article: Sarah P. Elbert, Arie Dijkstra & Andrea D. Rozema (2017) Effects of tailoring ingredients in auditory persuasive health messages on fruit and vegetable intake, Psychology & Health, 32:7, 781-797, DOI: 10.1080/08870446.2017.1300259

To link to this article: http://dx.doi.org/10.1080/08870446.2017.1300259

Psychology & Health, 2017
Vol. 32, No. 7, 781–797, https://doi.org/10.1080/08870446.2017.1300259

Effects of tailoring ingredients in auditory persuasive health messages on fruit and vegetable intake

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(*Received 19 May 2016; accepted 13 February 2017*)

Objective: Health messages can be tailored by applying different tailoring ingredients, among which personalisation, feedback and adaptation. This experiment investigated the separate effects of these tailoring ingredients on behaviour in auditory health persuasion. Furthermore, the moderating effect of self-efficacy was assessed.
Design: The between-participants design consisted of four conditions. A generic health message served as a control condition; personalisation was applied using the recipient's first name, feedback was given on the personal state, or the message was adapted to the recipient's value.
Main outcome measures: The study consisted of a pre-test questionnaire (measuring fruit and vegetable intake and perceived difficulty of performing these behaviours, indicating self-efficacy), exposure to the auditory message and a follow-up questionnaire measuring fruit and vegetable intake two weeks after message exposure (n = 112).
Results: ANCOVAs showed no main effect of condition on either fruit or vegetable intake, but a moderation was found on vegetable intake: When self-efficacy was low, vegetable intake was higher after listening to the personalisation message. No significant differences between the conditions were found when self-efficacy was high.
Conclusion: Individuals with low self-efficacy seemed to benefit from incorporating personalisation, but only regarding vegetable consumption. This finding warrants further investigation in tailoring research.

Keywords: persuasion; tailoring; behaviour change; fruit and vegetable intake; auditory communication; self-efficacy

To stimulate the adoption of healthy behaviours, it can be useful to tailor persuasive health information to individual characteristics of the recipient (Dijkstra, 2005; Hawkins, Kreuter, Resnicow, Fishbein, & Dijkstra, 2008). Research suggests that tailored information can be more effective compared to non-tailored information (e.g. Dijkstra, 2005; Lustria et al., 2013; Noar, Benac, & Harris, 2007). Until now, almost all tailored health interventions are delivered via the visual communication mode, in which recipients read the tailored information, or via the audio-visual mode in which auditory and visual elements are combined (such as video-tailoring or face-to-face counselling). To the best of our knowledge, computer-tailoring has not been investigated yet within the single auditory mode of communication. Yet, there is a potential value and reach of

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the auditory mode of communication; with technological advancements such as audiobooks, smartphone applications and MP3 technology, persuasive texts can be delivered via an auditory mode in which recipients listen to the information.

Thus, the effects of using auditory (tailored) information are still unknown. We do know that auditory communication has certain unique characteristics. For instance, an essential difference between the auditory communication mode and visual forms of communication (e.g. written or pictorial) refers to the presence of the voice. In auditory persuasion, the voice of the source is clearly imposed onto the recipient and the source can be perceived as salient, providing an enhanced sense of social proximity (Chaiken & Eagly, 1983; Jensen, Farnham, Drucker, & Kollock, 2000). On the one hand, attending to auditory information can be more convenient than reading, for example when one is performing simple and automated tasks, such as car driving, household tasks, and sport exercises. On the other hand, auditory tailoring elements are often integrated in interactive systems that include visual elements as well (e.g. videos). In this context, it seems to be helpful to understand the effects of auditory messages.

Tailoring is a 'multidimensional communication strategy' to develop individualised messages that can potentially lead to behaviour change (Lustria et al., 2013). A tailored persuasive message typically includes one or multiple tailoring ingredients. These ingredients are the core aspects of tailored messages that target psychological processes which are not or to a lesser degree addressed by non-tailored messages. Three broad classes of tailoring ingredients can be distinguished (e.g. Dijkstra, 2005, 2008; Hawkins et al., 2008; Kreuter, Strecher, & Glassman, 1999): personalisation, feedback and adaptation.

First, personalisation is the incorporation of one or more individual characteristics in a generic text, for example by stating: 'Dear Alice, hereby we provide you with some new information on the outcomes related to insufficient fruit and vegetable consumption'. In this example the receiver's first name, the personalisation ingredient, is incorporated into a generic text. In personalisation, the recipient is addressed explicitly (Dijkstra, 2008). Second, it is possible to add individualised feedback about a certain attitude or behaviour: 'You indicated that you experience few difficulties with consuming sufficient fruit and vegetables, that is very good'. Feedback is also explicitly referring to the recipient (Dijkstra, 2008). Finally, adaptation or content matching refers to an adjustment of the content information (arguments, recommendations) in a way that it matches with relevant characteristics of the individual recipient. An adapted persuasive text for an adolescent on fruit and vegetable intake might differ from a text aimed at older people, for instance by taking into account the parental intake and home availability/accessibility of fruit and vegetables when the text is aimed at adolescents. In adaptation, the recipient may not be aware that the information is designed for him or her personally (Dijkstra, 2008). There is evidence available for the effectiveness of the three ingredients separately in textual messages (Cesario, Grant, & Higgins, 2004; Dijkstra, 2005; Oenema & Brug, 2003; Skinner, Strecher, & Hospers, 1994), but not in auditory messages.

Investigating the separate influence of the tailoring ingredients might further increase understanding on the parts of the message that can be effective. That is, the specific ingredients can lead to a different extent of self-referent encoding, which is defined as the extent to which recipients interpret the information against the background of the self (Rogers, Kuiper, & Kirker, 1977). For instance, a study on

personalisation showed that it increased the number of self-referent thoughts of recipients (Dijkstra & Ballast, 2012). Self-referent encoding is seen as an important underlying mechanism in the relationship between tailoring ingredients and persuasion (Dijkstra, 2005; Hawkins et al., 2008; Kreuter, Bull, Clark, & Oswald, 1999a).

In addition, the information that is perceived as personally relevant might receive more attention. Based on the elaboration likelihood model (Petty & Briñol, 2012; Petty & Cacioppo, 1986), the personally relevant information can lead to careful consideration and higher elaboration, which is in turn associated with higher potential for persuasion (Kreuter et al., 1999a; Oenema, Tan, & Brug, 2005). Self-referent encoding might thus stimulate central processing of the content persuasive information (Dijkstra, 2008; Rogers et al., 1977). Typically, in the domain of health with its aversive health outcomes, this self-referring and central processing may elicit a state of threat (based on the extended parallel process model; Maloney, Lapinski, & Witte, 2011; Witte, 1992, 1994). Especially personalisation and feedback that are explicitly addressing the recipient might induce a threat. This threat may be the primary motivation to comply with the persuasive message. Whether this threat is transferred into behaviour may however depend on individual differences in self-efficacy (Peters, Ruiter, & Kok, 2013; Witte, 1992).

Self-efficacy refers to beliefs about one's capabilities to adequately perform a certain behaviour, and it has been shown to be an important predictor of fruit and vegetable intake, the behaviour that will be central in the current study (Guillaumie, Godin, & Vézina-Im, 2010; Kreausukon, Gellert, Lippke, & Schwarzer, 2012). Recipients who report difficulties eating sufficient fruit and vegetables (indicating low self-efficacy regarding this behaviour) may be expected to display defensive self-regulatory processes after being exposed to the threatening health information (fear control), as they might experience they are unable to perform the behaviour. This might consequently lead to lower persuasion. On the other hand, recipients high in self-efficacy may experience no or few difficulties in performing the behaviour and possibly have found ways and resources to perform the behaviour themselves. The threat can be transferred into behaviour change in those people, irrespective of the specific applied tailoring ingredient (danger control; Maloney et al., 2011; Witte, 1992, 1994).

In the present study, we aim to gain more understanding on the effect of each of the three tailoring ingredients when applied within the auditory mode of communication. It is assumed that the tailoring ingredients as tested in the conditions bring the persuasive information, probably to a different degree, closer to the self. The threat they induce may be solved by changing the health behaviour in the advocated direction. Besides testing the separate tailoring ingredients in auditory persuasion, it is investigated how these effects vary for recipients differing in self-efficacy. It is initially expected that differences between the conditions will be most explicit in people who experience difficulties with performing the behaviour (indicating low self-efficacy).

Method

Design

The current study investigated the persuasive influence of the tailoring ingredients personalisation, feedback and adaptation in auditory persuasion in a between-participants design.

Personalisation was operationalised as mentioning the respondent's first name in the message three times; feedback was given on the self-reported fruit and vegetable consumption, and adaptation was operationalised as providing persuasive information that was congruent with the respondent's choice of his or her most important value (enjoying life vs. health). The control condition comprised of a generic auditory persuasive message.

Self-efficacy regarding the intake of sufficient fruit and vegetables, indicated as the perceived difficulty of the behaviour, was tested as a moderator and the dependent variable was represented by the self-reported fruit and vegetable consumption at 2-week follow-up. In total, the study consisted of three parts: (1) a pre-test; (2) exposure to the health message and an immediate post-test assessing understanding of the message and self-referent encoding as measures regarding the manipulation check, and; (3) a follow-up measurement two weeks after the immediate post-test (assessing fruit and vegetable intake). This seems a relevant and appropriate period in relation to the low intensity of the intervention (respondents were only exposed to the information once) and the nature of the assessed health behaviour.

Recruitment

Respondents were either recruited as first-year psychology students of the local university or as (former) students from a participant pool of the local psychology department with a general interest in joining scientific research. Respondents were told that they would participate in an online study on communication and lifestyle and received either partial (first-year psychology) course credits or a monetary compensation (€ 6) for completing all three parts. Data were only included in the statistical analyses when they were available from all three measurements. The study was approved by the ethical committee of the local faculty of Behavioural and Social Sciences for conducting human participants research (nr. 13001-N). The data were collected from October until December 2013.

Procedure

The measurements and the tailored auditory health message were all presented online. At pre-test, a screen with informed consent information was presented to the respondents, addressing the confidentiality and duration of the study (<15 min per study part). Informed consent was obtained here from all respondents included in the study. Then, respondents could answer the pre-test questions, partly consisting of questions for tailoring purposes. After having filled in the pre-test, respondents were sequentially assigned to one of the four experimental conditions in order of completion of the pre-test. The first names of participants who were assigned to the personalisation condition were, then, used to develop a personalised message for each respondent in a professional recording studio. After this recording session, 17 extra respondents signed up and completed the pre-test questionnaire. Yet, the possibility to create personalised sentences for these respondents was now excluded (for logistical reasons only). Therefore, these respondents could not be randomised to the personalisation condition anymore and were randomly assigned to one of the three remaining conditions.

On average, about one month after the pre-test, the manipulations and immediate post-test were distributed. The time between the pre-test and the manipulation varied

between 8 and 53 days ($M = 26$, $SD = 9.9$). Respondents were then exposed to an auditory message advocating fruit and vegetable consumption, that was either generic, personalised, that provided feedback, or that was adapted to the respondent's value. To ascertain that the volume of the actual health message was sufficient and convenient, an auditory recording was presented with instructions on volume regulation. While listening to this instructive recording, respondents could adjust the volume to their individually preferred level. Subsequently they listened to the health message and answered post-test questions. Two weeks after having filled in the immediate post-test, respondents received the link to the follow-up questionnaire on fruit and vegetable intake by e-mail. The time between the immediate post-test and the moment that the follow-up data were received varied between 13 and 31 days ($M = 15.4$, $SD = 3.5$). If respondents did not fill in the post-test or follow-up questionnaire within five days, a reminder was sent via e-mail. When necessary, more reminders were sent (time interval between reminders was maximally nine days, and maximally three reminders per questionnaire).

The tailoring conditions

The auditory health messages were all spoken by a female actress who was selected in collaboration with the recording studio. It was our intention to select a voice that was gender congruent; that is, a high-pitched and feminine voice. The professional actress was instructed to use her voice as normal and natural as possible and to speak as a newsreader. All messages were recorded in one session. The tailored messages were created by copying and pasting different auditory fragments in such a way that it sounded natural.[1] In sum, in all four conditions, respondents were exposed to an auditory health message in which one specific tailoring ingredient was applied (except for the generic health message; see supplemental online material to get an impression of the messages). The recordings were mastered in 96 kHz 24 bit and converted to standard mono MP3 format (128 kbps).

The generic message

The generic health message was positively framed, referring to both positive health outcomes that can be approached (e.g. increased physical stamina) and negative health outcomes that can be prevented (e.g. a decreased risk for cancer and heart diseases; 223 words in total, 88 s). The presented outcomes were based on an earlier study that applied textual health messages on fruit and vegetable consumption (Dijkstra, Rothman, & Pietersma, 2011). In addition, the generic text contained two sentences (approximately 10% of the total amount of text) referring to the hedonic aspects of fruit and vegetable consumption (e.g. smell, freshness, taste, ease). The message ended with a closing sentence ('Thus, eating sufficient fruit and vegetables does not necessarily take a lot of effort and it contributes to a healthy lifestyle').

The personalised message

The personalised message (231 words in total, 92 s on average) consisted of the same content as the generic health message, but now with the incorporation of the respondents' first name for three times. The message started with 'Dear [*respondent's first*

name]'; it was incorporated halfway the message by stating 'So, dear [*respondent's first name*], if you eat sufficient fruit and vegetables …', and in one of the final sentences as well by stating 'Furthermore, fruit and vegetables do have a nice smell and taste, don't you think [*respondent's first name*]'?

The feedback message

In the feedback message, before listening to the generic text, three sentences on the self-reported (weekly) fruit and vegetable intake were added. Four feedback versions were created (255 words and 98 s on average) based on the respondents' reported fruit and vegetable intake of the previous week, as indicated at pre-test. Based on this measurement, it was calculated whether it was sufficient or insufficient against the background of the contemporary Dutch recommendations for fruit and vegetable intake (see later). Then, the feedback was provided on a combination of either sufficient or insufficient fruit and vegetable consumption, respectively (sufficient fruit and vegetable consumption ($n = 4$), *in*sufficient fruit and vegetable consumption ($n = 8$), sufficient vegetable consumption but *in*sufficient fruit consumption ($n = 5$), or sufficient fruit consumption but *in*sufficient vegetable consumption ($n = 10$)). Each combination consisted of three types of feedback, based on at least two studies (Dijkstra, 2008; Oenema & Brug, 2003):

> You indicate that you eat *(in)*sufficient fruit and vegetables [objective feedback/personal feedback], that is very good *(that is a shame)* [evaluative feedback]. Try to continue this (*try to make some changes*) [action-oriented feedback/adjustment feedback]; what people eat influences how healthy they are and how they feel.

In any case, the last sentence of the feedback replaced the first sentence of the generic health message and it was designed and recorded in a way that it could easily be implemented.

The adaptation message

In the adaptation message, the content was adapted to the respondents' 'most important value in life' as indicated at pre-test. This is based on the concept of values that are important in defining oneself and that may consequently determine which arguments one will find persuasive (e.g. Snyder & DeBono, 1985). More specifically, in the context of health, these two values (health value; hedonistic value) are considered to be fundamental in the performance of the behaviour, related to the long-term consequences of health, and the more hedonic short-term consequences, respectively. Therefore, two versions of the generic health message were created. When respondents indicated that health is their most important value in life, they were exposed to a message on the positive health effects of sufficient fruit and vegetable intake only (e.g. lowering health risks and preventing weight gain, without referring to any hedonic aspects of fruit and vegetable consumption; 229 words in total, 91 s). When respondents indicated that 'enjoying life' is their most important value, they were exposed to a hedonic text that only stressed the unique smell and taste of fruit and vegetables, and the ease of eating fruit and vegetables (242 words in total, 101 s). Prior to both messages a short title was mentioned ('the vulnerability of life' vs. 'enjoying life').

Tailoring questions

Throughout the pre-test, several questions for tailoring purposes were asked. Firstly, the information we needed for the personalisation message was the respondents' first name. Secondly, for the feedback message, distinct indices for fruit and vegetable consumption were used to determine whether fruit and vegetable consumption was (in)sufficient, according to national recommendations as formulated by the Netherlands Nutrition Centre (2011): A daily consumption of two pieces of fruit and two-hundred grams of vegetables for an adult population. For respondents who received the feedback message, the combination of these scores was used to determine which feedback the respondent would be provided with. More specifically, cut-off points for sufficient weekly consumption were set at 28 (7 × 4) portions of 50 grams of vegetables and 14 (7 × 2) pieces of fruit (defined as one large/average piece of fruit, two tangerines, as well as a bowl of strawberries or other small pieces of fruit, or five table spoons of apple sauce, a commonly used product in the Netherlands), respectively.

Finally, for the adaptation message, the respondents' 'most important value in life' was assessed with the question: 'People differ in what they find important, in the values that they strive for. What is most important to you?' The answering options were 'health' and 'enjoying life', and 79% of all respondents chose 'enjoying life' over 'health'. For respondents who were assigned to the adaptation message condition, the answer on this item was used to determine which version of the auditory persuasive text had to be used. Only three respondents received the health-adaptation message.

Measures

Pre-test measures

At pre-test, gender, age and cultural background were assessed. Next, participants were asked to indicate to what extent they considered themselves as healthy (see also Elbert & Dijkstra, 2014; perceived own health status, based on Centraal Bureau voor de Statistiek 2013). The intention to start consuming more fruit and vegetables in the next year was assessed with two items ($r = .77$, $p < .001$). These items could be answered on seven-point scales ranging from 'absolutely not'/'very unlikely' [1] to 'absolutely'/'very likely' [7] (see also Elbert & Dijkstra, 2014).

In addition, two items assessed the perceived consumption of fruit and vegetables, respectively. These items could be answered on a five-point scale ('minimal' [1]/'few' [2]/'slightly insufficient' [3]/'sufficient' [4]/'more than sufficient' [5]). Furthermore, two items assessed perceived difficulty of performing the advocated behaviour, eating sufficient fruit and vegetables, respectively: 'How difficult is it for you to eat sufficient fruit/vegetables'? Both items could be answered on five-point scales ('not difficult at all' [1]/'not difficult' [2]/'neutral' [3]/'difficult' [4]/'very difficult' [5]).

Finally, respondents were asked to complete a detailed and validated frequency questionnaire on their fruit and vegetable intake (two scales reflecting pre-test self-reported fruit intake and self-reported vegetable intake, as used for tailoring purposes as well; Bogers, van Assema, Kester, Westerterp, & Dagnelie, 2004). Respondents could indicate how often on average they ate or drank products from several fruit and vegetable categories during the previous week. The answering options ranged from 'never or less than

1 day a week' [0], '1 day a week' [1] to 'every day' [7]. Next, they were asked to indicate the amount of intake per category of fruit or vegetables (answering options ranged from 'no pieces/glasses/serving spoons' to 'five or more pieces/glasses/serving spoons'). The main categories for vegetable consumption were 'cooked vegetables' and 'raw vegetables/salad', and the main categories for fruit consumption were 'tangerines', 'oranges/grapefruits/lemons', 'apples/pears', 'bananas', 'other fruit' and 'apple sauce'. The category reflecting fruit and vegetable juice was removed, as it did not distinguish between fruit and vegetable consumption. The average number of days per week and the pieces of fruit (one piece is defined as one large to average piece of fruit, two tangerines, a bowl of small pieces of other fruit, or five table spoons of apple sauce) and vegetable portions (defined as 50 grams each) were multiplied for each category.

Post-test measures

At the immediate post-test, three questions regarding message understanding, message credibility and the extent to which the information was perceived as personally directed (perceived self-referent encoding) were asked to check whether the manipulations were received as intended. The questions were 'To what extent were you able to understand the message?', 'To what extent do you think the message was credible?' and 'To what extent was the information directed at you personally?' These 1-item measures could be answered on seven-point scales ranging from 'not at all' [1] to 'very good'[7], from 'not credible at all' [1] to 'very credible' [7] and from 'not personal at all' [1] to 'very personal' [7]. Subsequently, process variables not pertinent to the current study were included. At the 2-week follow-up, the main dependent variable was administered: Respondents completed the frequency questionnaire on their personal fruit and vegetable consumption of the last week, as assessed at pre-test (Bogers et al., 2004).

Statistical analyses

ANOVAs and ANCOVAs were used to perform the manipulation checks and the main analyses, respectively (software package: SPSS version 21). In the main analyses, self-reported fruit consumption and self-reported vegetable consumption two weeks after exposure were the dependent variables. Perceived *and* self-reported intake of fruit and vegetables were standardised and included as covariates in the main analyses, as these variables are conceptually related to the reception of health messages on fruit and vegetable intake. In addition, perceived difficulty of eating sufficient fruit/vegetables (as measures of self-efficacy) were tested in interaction with condition in two saturated models to see whether there were any moderating effects on self-reported fruit intake and self-reported vegetable intake, respectively (p-value was set at $p < .05$, two-sided). To further explore interaction effects, simple main analyses were conducted at two levels (low/high) of the moderator. To this purpose, the complete data-set was used to model participants as scoring high or low, by adding and subtracting one standard deviation to the standardised means, respectively (Cohen, Cohen, West, & Aiken, 2003).

Results

Participant characteristics

In total, 137 respondents completed the online pre-test questionnaire. Eighty-four percent of them ($n = 115$) listened to the health message in one of the four conditions and completed the immediate post-test. After that, another three respondents dropped out (82% response rate of the total sample). The final sample consisted of 112 respondents (80% females), varying in age from 17 to 54 years ($M = 23.7$, $SD = 7.00$), randomly distributed over the four conditions: Generic message ($n = 32$); personalised message ($n = 24$); feedback message ($n = 27$); adaptation message ($n = 29$). On average, participants indicated a rather good perceived health ($M = 4.88$, $SD = 0.71$), and an intermediate pre-test intention ($M = 4.12$, $SD = 1.31$). The average perceived difficulty of eating sufficient fruit was 2.59 ($SD = 1.10$), and the average perceived difficulty of eating sufficient vegetables was 2.23 ($SD = 0.95$). The frequency scores for self-reported fruit consumption at pre-test ranged from 0 to 77 pieces of fruit per week ($M = 12.1$, $SD = 9.7$), and for self-reported vegetable consumption from 3 to 63 portions of vegetables per week ($M = 24.7$, $SD = 11.5$). Based on these measures, 21% of the respondents was classified as consuming insufficient vegetables (but sufficient fruit), 24% was classified as consuming insufficient fruit (but sufficient vegetables), 35% was classified as consuming both insufficient fruit and vegetables, and 20% was classified as consuming both sufficient.[2] The average *perceived* fruit and vegetable intake scores fell in-between 'slightly insufficient' and 'sufficient'(fruit: $M = 3.31$, $SD = 1.13$; vegetables: $M = 3.72$, $SD = 0.95$).

Randomisation check

Univariate analyses were conducted to analyse whether the conditions differed on relevant pre-test measures. No significant differences between conditions were found regarding the distribution of gender ($p = .21$), age ($p = .21$), cultural background ($p = .62$), perceived own health status ($p = .21$), the most important value ($p = .38$), pre-test intention ($p = .21$), perceived vegetable consumption at pre-test ($p = .29$), perceived difficulty of eating sufficient vegetables ($p = .13$), self-reported fruit consumption ($p = .36$), and self-reported vegetable consumption at pre-test ($p = .77$; when dichotomised as insufficient vs. sufficient, $p = .06$ and $p = .37$ for fruit and vegetable consumption, respectively).

In addition, there were no significant differences between conditions regarding the time it took respondents to complete one of the measurements (respondents who did not complete it in one session were excluded in this analysis; $ps > .34$), time between pre-test and immediate post-test measurements ($p = .72$), time between post-test and follow-up measurements ($p = .89$), and number of sent reminders at immediate post-test ($p = .18$) or follow-up ($p = .73$). Only perceived fruit consumption at pre-test ($p < .01$) and perceived difficulty of consuming sufficient fruit ($p < .001$) were not randomly distributed across conditions. Therefore, this latter variable was added as third covariate in all subsequent analyses regarding fruit consumption (the variables perceived *and* self-reported fruit consumption were already added as these are conceptually related to the reception of health messages on fruit and vegetable intake).

Furthermore, we separately assessed whether significant differences between conditions were found for the respondents that completed the study and who could only be randomised to three conditions rather than four ($n = 9$). No significant differences were found regarding the set of pre-test variables as in the previous reported randomisation checks ($ps > .09$). Finally, we aimed to investigate whether this small group differed from the other respondents. The groups were compared on the same variables, and we did not find any significant differences between the groups as well ($ps > .15$).

Attrition analyses

We assessed whether dropouts after T1 significantly differed from the respondents who completed the study. The groups were compared on gender, age, cultural background, perceived own health status, the most important value, pre-test intention, perceived *and* self-reported fruit and vegetable consumption at pre-test, and perceived difficulty of eating sufficient fruit or vegetables. The results showed that dropouts had a significantly lower intention at pre-test ($p = .031$); the remaining variables did not differ significantly across these groups ($ps \geq .052$). Condition did not affect whether or not respondents completed the study ($p = .62$).

Manipulation checks

As expected, respondents who received the personalised message or who received feedback on their own fruit and vegetable consumption perceived the information as more personally directed at them ($M = 4.25$, $SD = 1.62$ and $M = 4.00$, $SD = 1.44$, respectively) compared to respondents who were exposed to the generic message ($M = 2.94$, $SD = 1.32$) or adaptation message ($M = 2.62$, $SD = 1.27$); F (3, 108) = 8.70, $p < .001$, $\eta^2 = .20$, contrasts $ps < .01$.

Furthermore, the conditions did not differ significantly regarding the extent to which respondents reported to understand the message, $p = .58$, $\eta^2 = .02$. A significant difference was found on perceived message credibility: $F(3, 108) = 4.32$, $p < .01$, $\eta^2 = .11$: The adapted message was perceived as significantly less credible compared to the messages in the other three conditions, contrasts $ps < .05$. This seemed to be caused particularly by the low credibility ratings of the respondents who received the hedonic version of the message. However, when this variable was controlled for in the main analyses on vegetable intake, only minor changes in F-values and p-values were found ($F(3, 101) = 2.52$, $p = .062$, $\eta^2 = .07$) that did not alter the interpretation of the findings.

Effects on health behaviour[3]

The effects on fruit intake were assessed first: the main effect of condition on self-reported fruit intake was not significant; $F(3, 105) = 1.06$, $p = .37$, $\eta^2 = .03$, with the following means: generic message ($M = 12.31$, $SE = 1.04$); personalised message ($M = 14.95$, $SE = 1.22$); feedback message ($M = 13.83$, $SE = 1.19$); adaptation message ($M = 12.83$, $SE = 1.10$). In addition, no significant interaction was found between condition and perceived difficulty of consuming sufficient fruit; $F(3, 102) < 1$, $p = .78$, $\eta^2 = .01$.

Furthermore, no main effect of condition was found on vegetable intake; $F(3, 106) < 1$, $p = .55$, $\eta^2 = .02$, with the following means: generic message ($M = 24.23$, $SE = 1.51$); personalised message ($M = 23.93$, $SE = 1.73$); feedback message ($M = 24.37$, $SE = 1.67$); adaptation message ($M = 21.49$, $SE = 1.59$). However, a significant interaction was found between condition and perceived difficulty of consuming sufficient vegetables; $F(3, 102) = 2.75$, $p < .05$, $\eta^2 = .08$. Figure 1 displays the means in the conditions for people with low and high self-efficacy.

In case of low self-efficacy, condition did not significantly affect behaviour, $F(3, 102) = 1.79$, $p = .15$, $\eta^2 = .05$. The mean scores reflecting weekly vegetable intake (with a score of 28 considered to be sufficient) were as follows: Generic message: $M = 20.18$; personalised message: $M = 25.95$; feedback message: $M = 22.39$; adaptation message: $M = 19.73$. Post-hoc contrasts showed that the intake of fruit and vegetables after listening to the personalised health message for this group of people was significantly higher compared to the adaptation message ($p = .032$). Compared to the generic message, this difference did not meet statistical significance ($p = .071$).

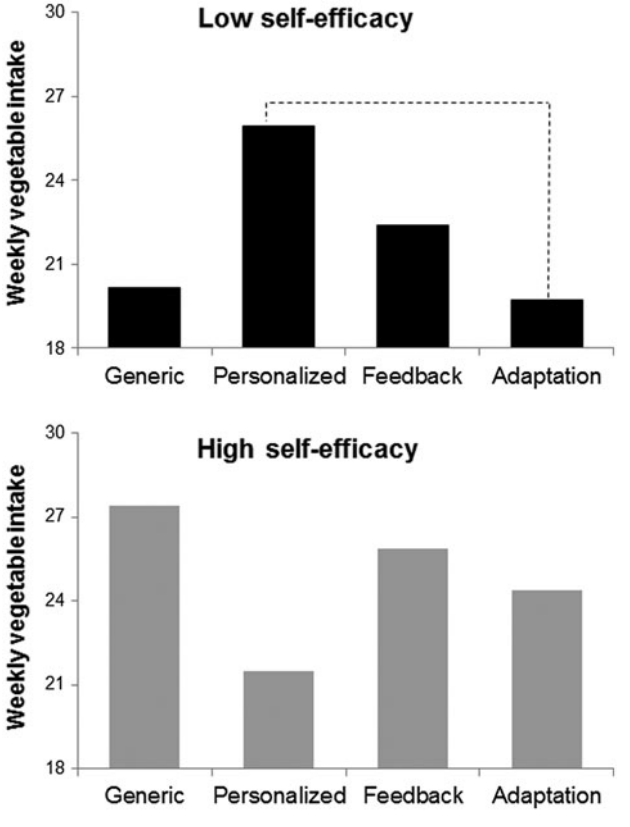

Figure 1. The interaction between condition and self-efficacy on vegetable consumption at 2-week follow-up.
Note: The estimated means of weekly vegetable intake (in portions) are given (28 portions is considered to be sufficient), controlled for the perceived and self-reported consumption of vegetables.

In case of high self-efficacy, no significant effect of condition was found $F(3, 100) = 1.31$, $p = .28$, $\eta^2 = .04$. For these people, tailoring did not significantly affect vegetable intake after two weeks. The means were as follows: Generic message: $M = 27.41$; personalised message: $M = 21.51$; feedback message: $M = 25.85$; adaptation message: $M = 24.40$. The only contrast approaching significance reflected the difference between the generic and personalisation message ($p = .056$).[4]

Additional analyses

First, the analyses on vegetable consumption were repeated in different samples with selected respondents only. For instance, it can be reasoned that the 9 respondents who signed up later *and* completed the study would show differences compared to those who signed up more quickly, for example in terms of research interest or enthusiasm, which could in turn affect differences between the conditions. Thus, the interaction effect between condition and perceived difficulty on vegetable consumption was analysed without these respondents. Only small differences were observed that did not alter the interpretation of the findings on vegetable consumption; $F(3, 93) = 2.68$, $p = .052$, $\eta^2 = .08$. In addition, it can be reasoned that the respondents who already consumed sufficient vegetables ($n = 49$) were not in need of a tailored health message. The analyses were performed without these respondents as well. In this case, the interaction was not significant anymore ($F(3, 53) < 1$, $p = .46$, $\eta^2 = .05$. Although this might be a matter of power, it shows us that this finding needs to be interpreted in a cautious way.

Second, as there was substantial variance in: (a) the number of days between pre-test and post-test and between post-test and follow-up; (b) the (electronically assessed) time in minutes it took the respondent to complete the measurements (respondents were excluded for these analyses when they did not complete the questionnaire in one session), and; (c) the number of reminders sent for the post-test and follow-up, the above statistical analyses were repeated when controlling for these variables one by one. Only minor changes in F-values and p-values were observed, that did not alter the interpretation of findings (effect sizes η^2 ranging from .06 to .09).

Discussion

In the current study, we examined the influence of tailoring ingredients in auditory health persuasion aimed at increasing fruit and vegetable intake. As no main effect on self-reported fruit and vegetable intake was detected, it can be concluded that none of the three tailoring ingredients was more effective than the generic message when it comes to actually influencing behaviour. An effect was only found in people who perceived consuming sufficient vegetables as relatively difficult (indicated as having low self-efficacy). Moreover, this effect could only be reported on vegetable consumption. This can possibly be explained by fruit and vegetable consumption being seen as different behaviours, and the perceived ease of consuming sufficient fruit and consuming sufficient vegetables may differ as well (Chapman & Armitage, 2012; Pietersma & Dijkstra, 2011). It might be that self-efficacy did have an effect on vegetable consumption only, as it is perceived as more difficult to perform this behaviour.

Yet, the finding that people with low self-efficacy showed a significantly higher vegetable intake after listening to the personalisation message was not expected on

forehand. While speculating, personalisation might have been so strong that it motivated people with low self-efficacy to make a larger investment, thereby engaging in an increased level of effort spending. It may be that the combination of: (1) personalisation and; (2) auditory persuasion, was especially powerful (see also Dijkstra, 2014; Dijkstra & Ballast, 2012). In auditory personalisation the source of the persuasive information actually pronounces the recipient's first name, which may bring the persuasive information even more close to the self, as if someone is speaking to the recipient personally (Chaiken & Eagly, 1983; Jensen et al., 2000). Therefore, this may be related to an empirical matter regarding the level of threat that was induced: When the level of threat becomes higher, as in the combination of personalisation and auditory persuasion, thresholds may be passed and different reactions may occur. It may be that the auditory personalisation was so powerful in self-referencing for people with lower self-efficacy that it reinstated unbiased and more central processing (Dijkstra & Ballast, 2012). All in all, tailoring in auditory persuasion induces some effects that are unknown yet. The basic lack of understanding into absolute threat levels shows the complexity of (auditory) persuasion research and practice. Process research is needed to further corroborate our theorising on the effects of personalisation and the differences between personalisation and feedback.

The results should be interpreted against the background of some limitations. First, the adaptation message was perceived as less credible compared to the other versions of the message. Indeed, we can imagine that the hedonic perspective on fruit and vegetable intake without addressing the health benefits lacked credibility. In addition, the adapted information was not perceived as personally directed to the respondent. This replicates earlier findings regarding adaptation as a tailoring ingredient (Dijkstra, 2005), and it proposes that adaptation as tailoring ingredient may work through other processes than self-referencing (Dijkstra, 2005; Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2003).

Furthermore, the distribution of the respondents between the two adaptation versions was skewed: Almost all respondents listened to the hedonic health message. However, this might not have influenced our results as we did not aim to compare the effects of the two adaptation versions. It seems that in this sample of mostly (former) students, the question on one's most important value did not assess much variation, although this might be different in other populations. Indeed, this specific sample was appropriate to join our study on basic tailoring mechanisms, but they are possibly not representative for other populations. All in all, the application of adaptation as a tailoring ingredient did not seem to be successful. An aspect that needs to be improved is the adaptation item to ensure that participants answer the question in a more balanced way. A final remark refers to the use of 'perceived difficulty' as an indicator of self-efficacy (see also Dijkstra, De Vries, & Bakker, 1996). Replication studies using other measurements of self-efficacy are necessary to build on the current findings.

As the current study did not compare the auditory mode of communication with the commonly used visual mode, it remains unclear whether and how auditory tailoring works qualitatively different from textual tailoring. Although one can think of (audio-) visual intervention elements that can be persuasive as well (e.g. avatars or video fragments), we focused on dismantling the effects of three tailoring ingredients in auditory persuasion without any visual cues being available. In addition, we aimed to look at the effects after only one single moment of exposure to the auditory presented tailored

information. This means the findings in this study might be useful in developing long-term tailored health interventions applied via the auditory mode of communication.

This study showed that the auditory mode of communication is a feasible way to incorporate tailoring ingredients. Additional costs for recording and editing the auditory fragments are likely to be made when applying auditory communication, although these aspects are facilitated by the use of software programs. Furthermore, this study taught us how to apply tailoring ingredients, while experiencing challenges that are unique for auditory communication, such as the integration of transitions and silences. This knowledge can also be applied when auditory information is applied together with visual elements.

In sum, the results suggest that *auditory* tailoring can have effects on behaviour up to two weeks later after a single moment of exposure to the tailored information, but this effect seemed to depend on the level of self-efficacy. No differences between conditions were found for those with high self-efficacy, and for respondents with low self-efficacy, a higher vegetable intake was only found after listening to the personalisation message. It seems relevant to take into account individual differences in the development of auditory tailored health interventions but possibly also in health persuasion contexts in daily life (e.g. telephone counselling with a dietician).

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by ZonMW – The Netherlands Organization for Health Research and Development under [grant number 121020021].

Supplemental data

Supplemental data for this article can be accessed here: http://dx.doi.org/10.1080/08870446.2017.1300259

Notes

1. More specifically, the feedback and personalisation sentences were carefully integrated with the generic health message content (which was recorded independently for the personalisation version), while taking into account the speech rate and natural pauses of the speaker.
2. Based on the recommendations for fruit and vegetable intake (Netherlands Nutrition Centre, 2011), a weekly intake of 14 (7 × 2) pieces of fruit and 28 (7 × 4) portions of 50 grams vegetables per week was considered sufficient in this questionnaire. Yet, it is important to note that these recommendations are subject to change; for instance, revised guidelines indicate 250 grams of vegetables per day to be sufficient instead of 200 grams (Netherlands Nutrition Centre, 2016).
3. Additionally, intention to start consuming more fruit and vegetables was assessed at immediate post-test (six items to be answered on nine-point scales regarding the planning and likelihood of starting to perform the behaviour; $\alpha = 97$, $M = 5.05$, $SD = 2.09$) A main effect of condition was found: $F(3, 103) = 352$, $p < .05$, $\eta^2 = .09$, controlled for pre-test intention, perceived own health, and aggregated measures of perceived difficulty, perceived and

self-reported fruit and vegetable consumption at pre-test The highest intention was found after listening to the health message with feedback ($M = 5.92$, $SE = 0.37$), which was significantly higher compared to the personalised message ($M = 4.31$, $SE = 0.37$, $p = .004$) and the generic message ($M = 4.73$, $SE = 0.32$, $p < .05$) The mean intention after listening to the adaptation message fell in-between those scores ($M = 5.20$, $SE = 0.34$) This pattern was particularly expressed in respondents who perceived the own health as relatively poor at pre-test (the interaction between condition and perceived own health status was significant, $F(3, 100) = 2.80$, $p < .05$, $\eta^2 = .08$)

4. Four respondents indicated they had a non-Dutch cultural background. In addition, two types of recruitment were used; exactly half of the respondents were first-year psychology students and the other half were mostly (former) students interested in joining scientific research. When we conducted the main analyses without the four non-Dutch respondents, the moderation effect on self-reported vegetable intake became non-significant ($F(3, 98) = 1.22$, $p = .31$, $\eta^2 = .04$), including the contrast. In addition, we did not control for the type of recruitment in our main analyses as the pattern of results did not change after including this factor as a covariate.

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